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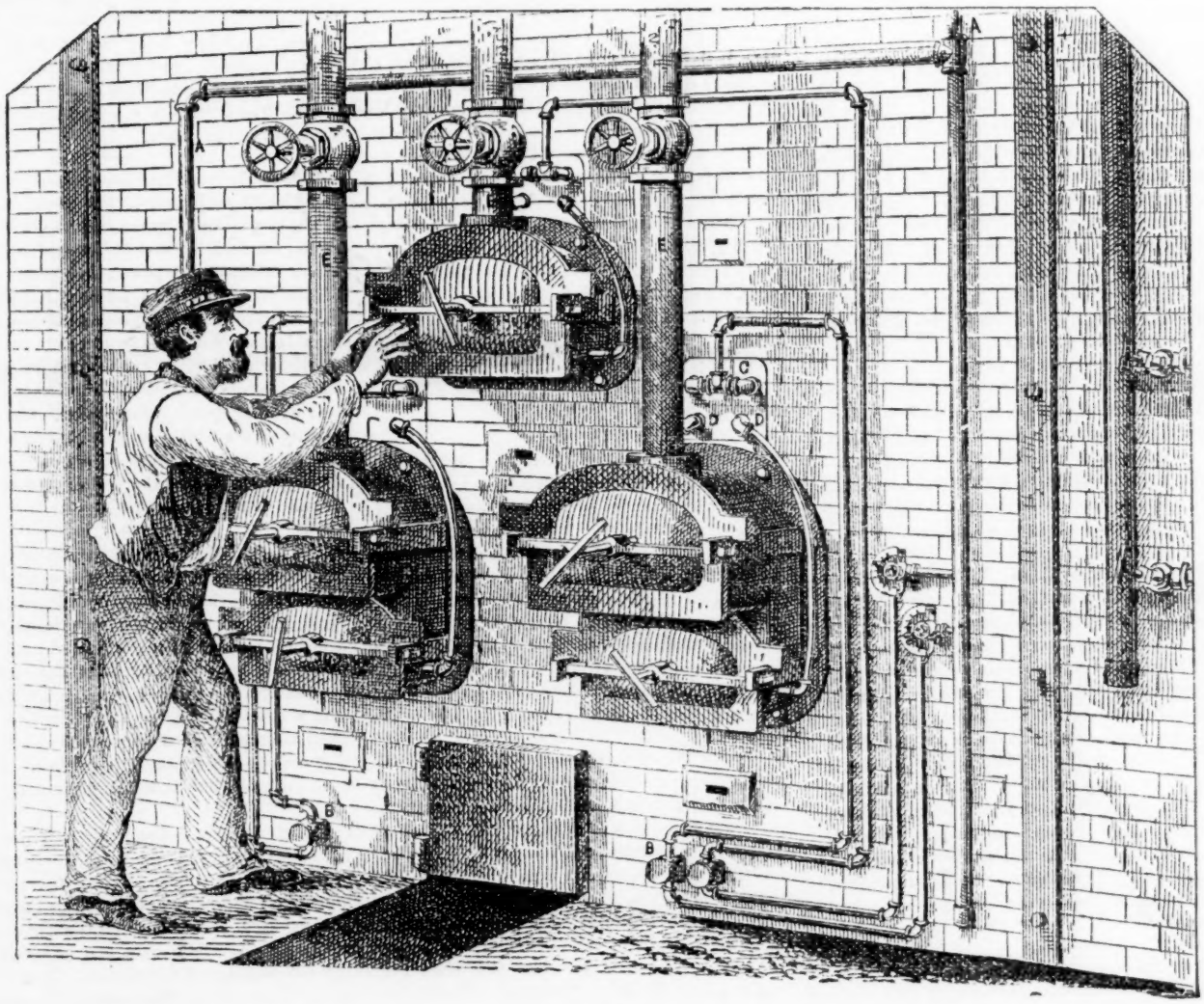


## The Gwynne-Harris, or American Hydro-Carbon Process.

The National Coal Gas Company, No. 4 Warren street, New York, has perfected an improvement in the manufacture of gas, which is well worth the attention of all who are interested in the production of this article.

Above we give a very fine and accurate engraving of a front view of one of their benches now in operation in the works of the Citizens Gas-Light Company of Brooklyn. To our general readers a minute description of it will be unnecessary. In the lower part of the bench are two patented double retorts, and above them i an ordinary single retort, all of which are enamelled. By the valves in the stand-pipes the air is excluded, when the lids are opened.

The steam from the boiler is first passed through an independent superheater, by which it is raised to five or six hundred degrees. The pipes on the face of the bench show how the steam is then conducted to the dryers, B B, at the bottom of the bench, and thence to the clay superheaters above the retorts, going in at C and coming out at D, and thence to passages through the distributing tiles laid in the retorts, forming a false bottom. Then through perforations in the upper surface of the tiles, the very highly heated steam passes up in finely distributed jets, through incandescent anthracite coal, and is perfectly decomposed, forming a gas of high calorific intensity, composed of hydrogen and carbonic oxide. This gas is then conducted into the main, to mingle with the coal, or oil gas, and is thus carburetted. The bench shown in the engraving, has been running more than seven months, and with two benches they are making one hundred thousand cubic feet of gas per day, at a cost of less than thirty cents per 1000 feet.

The Citizens Gas Company have their hydrogen benches connected with both their coal gas main, and their oil gas main, and also so as to run the hydrogen through the oil tank, as they are now doing, thereby dispensing with the use of air, for reducing the over rich gas made from oil. Either mode of using the hydrogen is a great saving, and each gives most satisfactory results.

# Chemical Repertory.

No. 104.—December 16, 1873.

EDITOR—HENRY WURTZ.

## CHEMICAL EXCERPTS.

928. Take Heed.—The crude ammonia salts resulting from the purification of coal gas are frequently found to contain sulphocyanides, which render them unfit for manure. In some cases the amount of sulphocyanide of ammonium present was sufficient to destroy the crops where it was applied.—*Engineer.*

929. We Second the Motion.—The Ohio Legislature is after the "non-explosive" dealers, and has passed a law which makes the seller of low test oils responsible for damage done to person or property by their use. Now make him guilty of manslaughter in case of death from their use, and we will soon be free from these venders.—*American Chemist.*

930. Rocky Mountain Coal.—A recent geological survey of the new territories of the United States reveals the important fact that on the line of the Northern Pacific railroad, in the Rocky Mountain district, there exists a coal-bearing region of 250,000 square miles in extent, the strata of available fuel buried there varying in thickness from five to thirty-five feet.—*Iron.*

931. British Gas-Patent.—J. Berrier, 39 Bedford Square, London. Glass gas chimney, capable of resisting any degree of heat without bursting.—In this a number of glass columns are placed horizontally side by side to form a circle, the columns being fastened at each extremity by a metal ring, which keeps them closely together, and forms a glass chimney similar to the ordinary chimney, but having the advantage of resisting any degree of heat without bursting, and giving a more brilliant light.

932. Carbolic Acid and its Relations to Creasote.—A. M. Read.—Carbolic acid dissolves in ammonia specific gravity 0·900, forming a clear colorless solution. Commercial carbolic acid gives a blue solution after a time. Creasote, if pure, is insoluble in ammonia. Hence ammonia is the best reagent to detect them in mixture.—*American Chemist.*

933. Tar for Fuel.—Messrs. J. G. Hey, of Hartshead Moor, Cleckheaton, and R. Sugden, of Brighouse, patented means or apparatus for treating and utilising gas tar for heating purposes. The tar is deposited in a still, to which we apply a steam-pipe; the heat of the steam renders the tar sufficiently limpid that it readily flows from the still into a pipe to which a second pipe supplied with steam is connected, the pressure of steam forcing or discharging the liquid tar in the form of a spray of gas, whereon it is fired. On the bars they deposit chalk-stone for retaining heat. In some cases they add to the tar in the still common soda, lime-water, and ammonia water in about the following proportions: To one ton of tar, one-tenth common soda, one-tenth lime water and ammonia water.

934. Coke for Smelting Iron.—Dr. Hoffman communicated to a recent meeting of German engineers a method for desulphurizing coke. It consists in extinguishing the coke as it comes from the ovens, with water containing chloride of manganese in solution. The sulphur passes off as sulphuretted hydrogen, while manganese and the excess of chloride of manganese remain, forming an advantageous addition to the coke for iron smelting. Chloride of manganese is a waste product in many factories of bleaching salts. It is understood that the process will be tried on a large scale.

935. Scotch Shale-Oil.—Mr. Young, the co-patentee of the new self-heating mineral-oil retort, has accepted an appointment from the Clippen's Company, near Paisley, who are fitting up a large work of these peculiar retorts. Another self-heating retort, said to yield even better results than the one referred to, has been tried at Oakbank Works through the summer. It is the patent of Mr. Dorman Hendersen, and can be readily managed by an unskilled laborer. The very low price of American petroleum at present depresses the Scottish shale-oil industry.—*Iron.*

936. British Gas-Patent.—J. D. Merriman, East India Road, London. Improvements in apparatus for lighting and extinguishing public and other lights.—These have reference to the use of electricity for the purpose of lighting and extinguishing public and other lights, and the application of the same consists in placing at the gas office or works a battery which is made to communicate with each lamp. Connected to the service pipe at the top of the lamp post is a cock furnished with a lever, the end of which is attracted by a magnet and thus opens the cock. The other end of the lever is formed into a fork to hold an arm fixed to a coil spring, which gives motion to a hammer that strikes the nose piece near the burner, when a spark is emitted and the gas lighted. When the gas light is to be extinguished, the magnet is de-magnetised, the armature is released, the cock closes- and the gas is shut off, the light being consequently put out.

937. A Self-Contained Water-Shed.—The city (Salt Lake) itself is situated at an elevation of about 4,600 feet above the sea, and about 200 above the level of Great Salt Lake. To the east and south of Salt Lake City, almost as far as "Utah Lake," is a well-defined water line at a point on the west side of the Wasatch range of mountains, about 400 feet above the elevation of Salt Lake City. A peculiarity that may not generally be known, is that the sink of the Carson, Truckee, and Humboldt rivers in the State of Nevada, are of the same elevation as Great Salt Lake, or within a few feet of the same. Outside of one small stream in southern Utah no water runs out of that territory, and none at all runs out of the State of Nevada, all the moisture sinking within its borders.—*Scientific Press.*

938. Artificial Marsh Gas.—The synthesis of marsh gas and of formic acid has been accomplished in the following manner by Brodie: Through a mixture of carbonic oxide and hydrogen a series of electric discharges was passed, and at the end of five hours about five per cent. of marsh gas was found to be present. This reaction is represented thus:

$$2CO + 6H = C_2H_4 + 2HO.$$

A mixture of carbonic acid and hydrogen subjected to the same treatment, yielded a very little marsh gas and carbonic oxide, but oily drops containg formic acid were deposited on the tube.—*Journal Applied Chemistry.*

939. Economical Consumption of Fuel.—The exhibition which will be held in Manchester by the Society for the Promotion of Scientific Industry, of appliances for this purpose, will be opened on the 18th December next. Exhibitors intending to exhibit should send in their applications at once. In connection with this subject, a gentleman has placed a gold medal at the disposal of the Council of the Society, for the best specimen of peat fuel that shall come nearest to coal in its use and character, special regard being had to its cheap and rapid production.—*Iron.*

940. Coal at the Cape of Good Hope.—The most important item of news from the Diamond Fields reports the discovery of coal of a superior description, and in very large quantities, within some distance of Kimberley. The discovery is regarded to be a wonderful one for the fields, as firewood is very dear, from £4 to £6 per wagon-load, and the trees much needed in the district are cut down, and the wood supply is now nearly exhausted. The coal company have a splendid market; and if they have lots of coals, as we hear they have, the coal company's shares will be more valuable than those of any diamond mine. The *Diamond Fields*, received by the last post, says in confirmation of this: "Some excellent specimens of coal were disposed of by auction, by Messrs. Murray and Piper, on Thursday last. The price realised was £2 2s. to £2 5s. per bag of 200 lbs. Good judges have declared the samples to be of first-rate quality, well adapted for all purposes, burning without shale, and leaving but little ash."—*Cape Standard, Sep.* 18.

941. English Gas-Patent.—I. Baggs, High Holborn, London. Improvements in the manufacture of gas for illuminating and other purposes.—In the usual way mixtures of hydrogen and carbonic acid gases, or of hydrogen and carbonic acid gases and carbonic oxide, however the same may have been produced or eliminated, pass through a heated "scrubber," the latter being placed vertically and filled with pieces of charcoal, coke, iron, or other suitable substances in such a manner that the carbonic acid which passes by filtration through the heated mass is converted into carbonic oxide, while the hydrogen and carbonic oxide (when the latter is contained in the mixture) pass by unaffected in their chemical character. Instead of merely purifying the gas as above described, the generation and purification by one process is preferred by means of two or more vertical scrubbers charged with suitable carbonaceous materials, arranged as a series, the whole being heated to a high degree. Steam is admitted to the first of the series, alternately ascending and descending, or *vice versa*, through the same. The scrubbers are heated, by preference, by means of the hot blast.

942. A Remarkable Tree.—In drying up Italian marshes, in getting rid of the swampy districts near Paris, and in using up the surplus water of the Camargue, an Austrian tree (*Eucalyptus globulus*) has shown extraordinary power. In addition to the faculty of absorbing ten times its weight of water from the soil, this plant is said to possess the power of destroying miasmatic influence by the emission of antiseptic camphorous effluvia. At the Cape its effect has been magical, while in Algiers fever has rapidly receded before the conquering *Eucalyptus*. Cuba attests the validity of the Australian plant in removing moisture and fever, and it is predicted by enthusiasts that the *Eucalyptus* will make short work even of the dreaded Pontine marshes.—*Iron.*

943. A Sad Disaster.—Recently, at the North Chicago rolling mills, about a dozen workmen were engaged in removing an imperfect blast from one of the furnaces, when suddenly a large mass of clinker was detached, making an opening in the furnace, and an immense volume of gas rushed out, and, coming in contact with the outer air, exploded, filling the place with a sheet of flame, which completely enveloped eight workmen, five of whom were so horribly burned that not one was expected to recover. Three others were seriously, but, it is thought, not fatally injured.

944. Pure Iron.—Absolutely pure iron is said to have been produced by a Russian chemist by means of the galvanic battery. During the process a large quantity of hydrogen was disengaged from the ordinary iron used. The pure iron is a silver white metal, very malleable and ductile, and so soft as to be readily cut with a pair of scissors. It is very different from iron which has heretofore been supposed to be pure. It oxidises very rapidly, and water is decomposed by it by the rapid absorption of oxygen.

945. Brazilian Coal.—The neighborhood of San Jeronymo, in Southern Brazil, having been explored by a company, the result was the discovery of two splendid seams of coal measuring in the one case three feet four inches, and in the other three feet ten inches, which must yield immense quantities of good gas and steam fuel. To facilitate the transport of the coal to Port Alegre a railway about nine miles in length has been constructed, under the superintendence of a young engineer (Mr. William Tweedie), and is now in excellent working order. On the 10th

of July the railways and collieries were formally opened by his Excellency the President of the province of Rio Grande do Sul.

946. Exaggerated Praise.—[If the National Councils are wisely guided, and we avoid further wars, we may come in time to deserve the following encomium, which at present is a preposterous over-laudation.—Editor.]

The *Colliery Guardian* of August 8th says: "American manufacturers have, from the first, been only placed at a disadvantage with England in one particular, and that is the comparative dearness of labor. To overcome this difficulty has been the task of inventive ingenuity and enterprise in the States for many years past, and the result is such a substitution of machinery for hand labor, and such an application of scientific methods to economize production, as can be matched probably by no other country in the world."

947. Bog Ores of Bohemia.—Vollmer.—These ores are stated to be far superior as purifying material to the Laming mixture, when impregnated with sulphur, inasmuch as they can be used dry, which is claimed to be a great advantage. Moreover, the percentage of ferric hydrate is twice as great as that in the Laming mixture; hence, the purifying power is, on that account, much greater. After saturation with sulphur, the mass serves as an excellent cement by two modes of treatment; either by mixing with iron filings and water, and kneading, or fusing with one-half its weight of sulphur. It has also been found, that, when dried and finely pulverized, it will dissolve in boiling coal tar, thereby forming an excellent article for purposes to which asphalt and tar are now applied, as roofing, etc.—*American Chemist.*

948. The Old Story Again.—At Middlesbrough an interesting instance has just been given of the inflexibility of the northern character. Danks's puddling furnaces are watched by the puddlers with no friendly eye. After several attempts it has been found impracticable to employ men accustomed to the old style of work in tending the new furnaces. Not only have the men to learn a new business, but to unlearn an old one. It has at last been discovered that the conversion of old puddlers into new ones is impracticablo. Intelligent mechanics, who know nothing of iron-working, are found far easier to train to the Danks furnaces than men who have been working for years, and it has been found expedient to dismiss the old hands and train up fresh ones to the work.—*Iron.*

## Monongahela Gas Company, of West Virginia.

A party of Baltimore gentlemen have recently purchased an extensive and valuable coal property in West Virginia, and received charter and been incorporated under the name of the "Monongahela Gas Company." The property is situated near Clarksburg, on the Baltimore and Ohio Railroad, 306 miles distant from Baltimore, and 78 from Parkersburg, and contains upwards of 1000 acres of the eight foot seam of gas coal, lying in the central line of axis of the great formation of bituminous coal, extending through West Virginia and Pennsylvania, on the western slope of the Alleghanies, from which is derived most of the coal used for the production of gas in the Eastern cities, and the manufacture of coke for the use of the iron foundries of the West.

The company has been actively engaged for several months in opening the mine, and making its railroad connections, and other works, as well as building houses for its work-people, which they have now nearly completed, and are of the most improved and substantial character. The company will be ready for business by the beginning of the new year, and have a capacity of production of 500 tons per day, which they can subsequently increase.

The seam of coal lies very favorably for economical working, being in immediate proximity to the railroad, and lying above water level, affording unusually good facilities for drainage and ventilation. The quality of the coal is found to be of most excellent character, being pure and very free from slate and sulphur. It gives a large yield of gas of high illuminating power, and it is also of excellent quality for heating and steam purposes.

The directors of the company are: Hon. H. G. Dairs, Messrs. George J. Appo d, Alexander Shaw, Thomas Gammel, Edward Roberts, J. A. Hambleton, W. F. Larrabue, C. J. Baker, James M. Hewlett, and A. Robinson.

Mr. Gammel has been elected President, and Mr. Robinson Secretary and Treasurer. Mr. John Bell, of Donaconing, is superintendent at the mine.—*Coal Trade Circular.*

## The Circulation of Water on the Surfnce of Our Earth.*

We live at the boundary of two oceans—the atmospheric and the liquid ocean. The extreme limit of the former is inaccessible to us, for the highest mountains are only shallows in the depth of its currents; of the latter, only the surface is known, while the secrets of its depth, and with them the greatest part of the solid surface of the earth are hidden from view. It is true that mighty masses of land project above the sea, and the solid basis of the atmosphere is to its liquid basis as 51 : 146; but the conception has long been abandoned that the elevations over the sea-level would be sufficient to fill out the gap which would break up the outline of the earth, if we could succeed in completely drying up the ocean. Humboldt determines the mean elevation of the continents as approximating 1,000 feet above the sea-level, while Bache calculates the mean depth of the Pacific at 14,190—a depth which, of course, is considerably exceeded in the deepest places; for Ross found in 15° 3′ south latitude, and 23° 14′ west longitude (Greenwich), no bottom at a depth of 27,000 feet; Denham, on the vessel Herald, in the South Atlantic, only at 46,000 feet; while Parker, on the frigate Congress, near the same place, did not succeed in finding any at a depth of 50,000 feet. Brooke, also, made soundings in the Indian ocean to a depth of 42,240 feet—an ocean in which already the ancient navigators had designated a place at the mouth of the Hoogly, in the Bay of Bengal, as "the bottomless pit." But, even if we imagine all seas and rivers actually dried up, we would yet be mistaken in thinking that we should then have to deal only with a solid mass. For the temperature, which rapidly increases towards the interior of the earth, leads to the conclusion that at a comparatively small depth, that which is solid at the surface becomes liquified in the glowing heat of the interior; that the solid crust surrounding this glowing liquid bears to the latter not even the same proportion of thickness as an egg-shell to its contents—nay, that it is so weak as to justify the opinion which has recently been expressed, that this crust could not bear as heavy a weight as the Himalaya range, and that the latter is floating on the liquid internal ocean as ice on water—a mighty berg, indeed, since it projects to a height of about five miles above the surface of the external ocean. This suggests, then, the opinion that the excess of the liquid over the solid in former times was greater still; that, indeed, in those times the whole earth was in a liquid condition.

The fundamental property of a liquid is the easy movability of its particles, which obey every force that impels them to motion. If no external force acts upon such a liquid, its single particles are under the exclusive influence of their own mutual attraction, and it consequently assumes a globular form, because this form most corresponds to the condition of the greatest approximation of all single parts. If water falls, gravitation can exert no plastic Influence upon it, since all parts of a falling body move with equal rapidity. This becomes still more strikingly monifest if we pour oil—which floats upon water, but sinks in alcohol—first into alcohol, and then add enough water to impart to the mixture of the heavier water and the lighter alcohol the exact density of the oil. The latter then contracts into a perfect sphere which floats freely in the transparent mixture, as the earth in universal space. If through the cover of the square glass vessel containing the mixture a wire is introduced, to the lower end of which a perpendicular metal-disc is attached, it is easy to approach the oleaginous sphere to this circular disc in such a manner as to cause it to completely surround the latter. If, now, the wire is made slowly to revolve around its axis, the inner disc sets the sphere in motion, and thereby changes its shape into that of a spheroid; while, with a greater rapidity of motion, the oil separates and rotates as a ring around the axis of rotation. If the second experiment illustrates the origin of the ring of Saturn, the first one explains how the formerly liquid earth received its spheroidal shape, and how the ocean exhibits this shape in its purest perfection, while the uneven outlines of the land allow it to become less distinctly manifest. If we refer our own motions to the centre of the earth, we therefore are so much the more distant from the latter the more we approach the equator; and, indeed, the mouth of the Mississippi is farther distant from the earth's centre than its source. Those who are fond of paradoxes may therefore say that this mighty stream flows up-hill. But, of course, in order to judge the descent of a river, its surface must at all places be determined according to its distance from the sea-level in its respective latitude—*i. e.*, according to the position the water would assume in connection with its mouth, in a state of rest.

We have compared the earth to a falling drop. This is, however, no mere comparison, but an actual reality; only the fall of this drop is directed towards the sun. We use here the expression "fall" in Newton's sense, according to which gravitation exerts its influence upon moving matter in the same manner as upon matter in a state of rest. If, standing on the surface of a frozen lake, we fire a ball from a rifle held in an exactly horizontal position, and at the same moment drop another ball out of our hand, they will both touch the surface of the ice at the same moment. However rapidly, therefore, the powder may impel the ball onward, it cannot resist the influence of gravitation, but falls exactly as the ball upon which the powder exerts no influence. The earth may be compared to a ball thus propelled by powder, which, without the influence of the sun, and when once in motion, would move on in a rectilineal direction. But the sun does not suffer this to take place; it always compels the earth to fall from the tangent towards itself, and thus converts its rectilineal path into a circular orbit. But the effects of all forces diminish as their distances increase. That part of the liquid earth which is turned towards the sun therefore falls farthest from the rectilineal tangent, its centre less far, the point on the opposite side the least, and in consequence both points are removed from the centre. This gives to the liquid earth the shape of an elongated spheroid, the longer axis of which is turned towards the sun. On a solid earth, the cohesion of whose particles prevents a change of their mutual relations, such a metamorphosis cannot of course take place; consequently all its particles move like the centre, since the particles lying before the centre hasten its motion in the same proportion as those particles lying behind retard it. Now, since the earth is neither entirely liquid nor entirely solid, the liquid water will assume a spheroidal shape upon the unchangeable solid sphere; *i. e*, it will accumulate at the points turned towards and away from the sun, and flow off the sides towards both places. If the earth were not revolving around its axis, the sea at those two places would at all times become deeper, while being shallower at the sides. But, as the earth revolves, the tide producing body changes its position, before the spheroid which it tended to produce in the liquid covering of the earth has been fully formed. This produces a wave which follows the luminary in its apparent motion around

* Translated for the *Am. Exch. and Review* from the German of H. W. Dove.

the earth. The liquid spheroid remains stationary, therefore, over the solid sphere revolving under it, and consequently every place comes twice within each day—viz., at noon and midnight—to the place of the deepening ocean, and twice—at 6 A. M. and at 6 P. M.—to the place of shallower water. This phenomenon is called the ebb and flow or the rise and fall of the tide.

We have thus far considered only the sun without referring to the quiet satellite of our earth, the moon, to which the earth bears a similar relation as the sun to the latter. But all attraction is mutual; therefore the moon does not only fall towards the earth, but the earth towards the moon—*i. e.*, it moves more rapidly when the latter precedes it in its orbit, more slowly when the moon follows; it turns sideways out of its orbit when the moon takes an intermediate position. For the same reasons, therefore, which cause the sun to produce a tide, the moon likewise has the same effect. If all three bodies occupy a position in line—*i. e.*, at the times of the full or new moon—the solar tide occurs at the same place as the lunar one; the water consequently rises higher, because attracted by both bodies. If the three bodies form a right-angle—*i. e.*, at the quadratures—the moon produces a high tide where the tide produced by the sun is least. The former, or spring tides, are consequently considerably higher than the latter, or neap tides. But, since the moon rises on every subsequent day 50 minutes or nearly an hour later, the lunar tide will, if it coincides on any day with the solar tide at noon, occur on the next day only at 1 P. M., and so on; so that after the lapse of a week the lunar flood will coincide with the solar ebb, while after a fortnight the occurrence of the rising tide will take place at the same time as at the beginning of this period.

Now, it might be thought that, since the small and not far distant moon, in her position, attracts with a power that is 160 times weaker than that of the greater and more distant sun, the lunar tide would be comparatively smaller. This would indeed be the case if the whole power of attraction of these luminaries were spent in the production of the tides. But we have seen that their tide-producing power is only the difference of their influences upon the centre and the surface of the earth. With regard to the moon and its near proximity, a radius of the earth more or less is of considerably more consequence than with regard to the sun, for the latter is separated from us by a distance of 12,000 earth-diameters, the former only by one of 30, but one-thirtieth of the moon's attraction is to one-twelve-thousandth of the sun's attraction as 5 : 2 (more accurately as 50 : 19); therefore, under the influence of the sun the ocean rises two feet, while under the moon's influence it rises five feet, for the difference of two small numbers may be much greater than the difference of two large ones. The average spring tides, therefore, will be to the average neap tides in the ratio of about 7 to 3—*i. e.*, of 5 + 2 to 5—2.

[To be continued.]

## British Coal-Production and Consumption.

In our last (Excerpt 916) we tried to stem the propagation of certain errors regarding the above subjects, that have had their source in the columns of our respected *confrere* the *Scientific American*. To support our own statements, made then from memory only, we shall now condense the following from an interesting paper by Dr. Rutherford, of Newcastle:

"The coal trade of the United Kingdom employs 413,334 men. The output of this great peaceful army is 120,000,000 *tons per annum*. Of this about 2,500,000 tons are exported to Ireland, 13,000,000 tons to foreign countries, 17,600,000 tons to domestic use, and 87,500,000 tons are used in our manufactures and for steam. Of these 85,000,000 tons, nearly 40,000,000 tons are wanted for steam, 7,000,000 tons for working coal and metal mines, and upward of 40,000,000 tons for the reduction of metals. Of the 40,000,000 tons wanted for steam, the merchant and steam navy take 3,250,000 tons; the railway and locomotive system more than 2,000,000 tons; *gas making, nearly 6,500,000 tons;* water-works and miscellaneous objects, 1,500,000 tons; the army, 200,000 tons; while 35,500,000 tons are required to drive our machinery. Of the 40,000,000 tons used for smelting purposes, not quite 1,000,000 tons are used for tin, copper, lead and zinc, and 19,000,000 tons for the manufacture of pig iron into bar-iron and steel. It is computed that three-fourths of the caloric expended in this conversis absolute waste, and it is here, perhaps, that the field for discovery and application of scientific processes is to be found. The principal fact determining the coal famine has been the urgent want of from 2,000,000 to 3,000,000 tons of coal extra for the production of pig and manufactured iron to supply the increased demand coming mainly from the United States and Germany. The capital employed in the coal trade is probably not more than £120,000,000. Supposing the average increase in the price of coal last year to have been 7s. 6d. per ton, the difference to the consumer would be £45,000,000, and of this amount not more than £10,000,000 has gone into the pocket of the miner, and not less than £30,000,000 into the pocket of the coal owner."

## "Gas Consumer's Manual; or How to Obtain Cheap Gas and Good Light."

By E. S. Cathels, A. I. C. E.

According to the promise given by us in the last issue, we herewith present a few sample-extracts taken from the above new work:

"There are three areas in every flame in which separate processes are going on at the same time, viz.: the internal area, where the preparatory process of decomposition is taking place, and so providing the hydrogen to give the required heat and the solid particles to be heated; the intermediate area of only partial combustion, where these solid particles attain to a white heat, every one becoming a centre of radiation and remaining so for a greater or less time (depending on the treatment the flame is subjected to) before burning out; and the outermost area, or surface, which receives a full supply of oxygen, and in which the particles of carbon are consequently oxydized or burnt up instantaneously, generating much heat, but little light.

The luminosity of the inflamed compounds of hydrogen ond carbon (carburetted hydrogen), therefore, depends on their *not burning simultaneously, but successively, so that one heats the other white hot*, which may be regarded as the second important fact in our investigation. Indeed, this statement embodies the whole philosophy of illuminating combustion. If gas be burnt in accordance with this cardinal law, all its illuminating power will be developed, and just to the extent that it is departed from, will be the destruction of the light.

* * * *

"Instead of the quiet gliding or inflow of gas from the burner to the flame, as is the case with candles and properly constructed lamps, there is a volcano on a small scale in action, making more or less havoc with this indispensable order or process in the production of light.

* * * *

THE REASON OF INCREASED PRESSURE BY INCREASED ALTITUDE.

'A kind of stereotyped reason one so often hears, is, that gas being lighter than air, ascends in virtue of its levity, which is quite correct in the case of gas issuing into the atmosphere; but in its conveyance through pipes the conditions are altogether different. Gas in pipes has no more natural tendency to flow up hill than down, and although we speak of the pressure increasing with increased elevation, it is in a similar sense to that in which, in ordinary phraseology, we speak of the sun rising and setting. The reason consists solely in *diminished atmospheric pressure*. The pressure in the pipe is the same whether in high or low levels; but that of the atmosphere varies according to the level, and the difference can only be ascertained by bringing them in contact—by balancing them against each other. To do this, a small pipe is screwed into the main pipe containing the gas, to the end of which there is a pressure gauge attached, being an inverted syphon, or U-shaped small glass tube, half-filled with water, one end being connected to the gas pipe, and the other left open to the atmosphere. It thus becomes a balance between the pressure or force of the gas exerting its influence on one leg, and that of the atmosphere on the other leg. The gas blows the water down the leg, connected to the pipe, a greater or less distance, depending on its force or "pressure," and, consequently, up the other leg to an equal distance, the amount of pressure being the space between the surface of the water in the one leg and that in the other. This is usually reckoned in tenths of an inch, a scale marked in tenths being attached to the gauge, but, for certain experiments requiring great exactness, instruments are used which magnify the scale to any required degree—usually ten fold—each tenth occupying one inch, and subdivided into tenths, so that cents or hundredths of an inch, are more easily read off than tenths in an ordinary gauge, as described. The diminution of atmospheric pressure, or increased gas pressure as it is called, is to the extent of about one-tenth of an inch "head of water," in technical language, for every ten feet of elevation.

"This natural law of diminished atmospheric pressure as affecting gases, whether by its frequent variations in any given place, or through elevation, is of the utmost importance in the physical economy of our dwellings, and in a variety of other ways. It holds good equally with deleterious, as with illuminating or coal gas, and in the case of houses situated on a high level, requires increased vigilance in keeping all drain traps properly sealed, to avoid noxious exhalations. These deadly gases escape where there is least atmospheric resistance, and, therefore, naturally more readily in higher than in lower levels.

* * * *

BURNERS.

"With the great majority of consumers, through the able suggestions and assistance of the gas-fitters, the problem of how not to obtain light from the gas burnt, is pretty successfully solved. Not only with the public, with whom it is excusable, but also with the majority of gas-fitters, who are without excuse for not knowing better, a burner is a burner, without any regard as to its suitability for the quality of gas to be burnt by it, or other circumstances of its application, just as with other persons a pill is a pill, apart from any considerations of its composition. It has been humorously observed that it is to the energy of the Scottish character that the world has been flooded with the ordinary metallic nib or fish-tail burner. Being made by machinery and turned out by the gross, they have the advantage of cheapness, but their cheapness is an example with a vengeance, of "spoiling the ship for a penny worth of tar." Because they are admirably adapted for burning Scotch Cannel gas, which is of from 25 to 35 candle power, and being so rich in carbon requires to be spread out into a thin sheet to prevent smoking, it seems to be generally assumed by gas-fitters that they are equally suitable for common coal gas of about half that illuminating power. Or perhaps it may be nearer the truth to say that as a rule, no consideration whatever is given to the subject, but that they are used simply because they are the cheapest.

* * * *

"Another simple expedient for retarding the carbon in the flame of a fish-tail burner, is known as Scholl's Perfector, which is used in England to a considerable extent, and which is wonderfully efficacious when applied to small-flamed burners and high pressures. It consists of a thin brass ring fitting over the burner, and having a narrow strip of platinum stretched across the centre, with its lower edge resting on the top of the burner, between two holes, so that instead of the two obliquely issuing streams of gas, flowing against

each other, they strike against the strip of platinum, and are so left as it were eddying in the flame.

"The writer made a series of careful experiments with this contrivance a few years ago, of which the following are some of the remarkable results obtained:

"With a No. 1 fish-tail burner (the light from which, with common coal gas, is exceedingly small and feeble, through the small consumption of gas and the flame too thin,) the additional light being obtained was as under:

"Pressure, 5-10ths., consumption of gas, 1·6 cubic feet per hour; additional light, 113 per cent. Pressure, 7-10ths.; consumption of gas, 2·0 cubic feet per hour, additional light, 159 per cent. Pressure, 10-10ths., consumption of gas, 2·4 cubic feet per hour, additional light, 195 per cent.

With a No. 3 burner also tested at 5-10ths, 7-10ths, and 10-10ths pressures, the consumption of gas being respectively 3, 3·7, and 4·6 feet per hour, the increased light was from 80·9 to 95·6 per cent.

But with a No. 5 burner, consuming 6 feet and upwards per hour, the advantage of the perfector was practically *nil*.

These results show that the perfector is highly advantageous with thin sheets of flame burning at high pressures, but that as the flame is thickened and the pressure reduced, the advantages become less and less until they practically cease.

INTERNAL PIPING.

As an instance of the reprehensible custom of fixing too small pipes, the writer, passing a new house in this city (Montreal) recently, and noticing indications of the gasfitters being at work, went inside, as a matter of curiosity, to see what was being done. He found the pipes laid for the supply of two rooms connected by folding doors, provision being made for a chandelier in the centre of each, and two brackets over each fire-place, the *whole* being wrought iron tubing of 3-8ths of an inch bore. On observing to the leading man doing the work, that if 3-eighth pipe was a proper size for the supply of each of the single lights, it was surely not large enough to supply them all, of which there would be ten, (assuming the chandeliers to have each 3 burners), on occasions of their being lighted, he replied that the pipe was large enough, and that *that was the size they always used.* The assertion of a 3-eighth inch pipe being sufficient for the supply of ten lights at a proper pressure being demurred to, the rejoinder was that the service-pipe was only one inch bore.

## The New Straw Burning Steam Engine.

An interesting trial has been made at Vienna, before several German professors and landed proprietors, of the patent steam engine (illustrated and described on page 403 of our volume XXVIII) which utilizes as fuel straw and other vegetable products. This engine is one of the novelties of the exhibition. A 10 horse power engine was used for the experiment, making 140 revolutions per minute, and the brake was loaded for a duty of 19 horse power. 355 lbs. of straw was carefully weighed, consisting partly of straight rye and partly of loose broken wheat straw, purposely mixed in order to test the capabilities of the engine for burning all kinds of fuel of this description. It required 46 minutes to consume the straw, steam being kept up during the whole time at a pressure of 70 lbs. per square inch with the greatest regularity. This result gives a consumption of about 24·5 lbs. of straw per horse power per hour, and as an engine burning average coal under similar circumstances would have required about 6·4 lbs. per horse power per hour, it appears that rather less than 4 lbs. of straw are equal to one lb. of coal. In thrashing, about nine sheaves of straw are required to thrash 100 sheaves of wheat or barley. Everbody present was highly satisfied with the results of the experiment, as it has long been the desire of the eastern farmer to find some means of using steam power without incurring the enormous expense of bringing coal and wood from a long distance. This invention completes another link in the history of the steam engine, and will enable every farmer who grows more straw than he requires for the use of his estate, and who is miles from a coal mine or forest, to use steam instead of animal power, and at far less cost than hitherto.—*Sci. Am.*

# Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

### Burning Tar as Fuel.

New York, December 12, 1873.

Mr. Editor: In your paper of September 16th you published a communication from me, on the subject of burning coal tar as fuel. The following is as clear a statement of my process of burning tar as I am able to make: I place on the top of the bench at one side of the retorts, a vessel made of galvanized iron holding ten to fifteen gallons, with a cover fitting tight enough to keep out dirt and dust. In this vessel I pump the tar from my tar well. At the bottom of this vessel is an outlet of ¾ inch pipe, which runs down the front of the bench to near the top of the lower retorts. This pipe which runs down has a stop cock at some convenient place in it, to prevent the tar from running out of the vessel when it is not wanted for burning. At the bottom of this pipe, attached to it, projecting to the front, at right angles with the pipe, is a little appliance made of brass or composition metal, which looks more like an old fashioned faucet for drawing cider or beer from a barrel, than anything else I think of; it is about four inches long and nearly one inch in diameter. *The success of the whole operation is in this little appliance.* The tar comes into this appliance, (I do not know any mechanical name for it), runs through it and comes out of a small nipple on the under side, in a small stream, and falls into an elbow gas fitting on the end of a piece of ordinary gas pipe, ¾ inch size, and is then carried by this last pipe over the lower retort (the pipe resting loosely on the mouth-piece), to a point above the middle of the furnace door. At this point we made a hole in the bench, about the size of two bricks, and inserted a piece of fire-brick, running inwards, over the fire, 12 to 15 inches, inclined downwards as it runs in. The tar runs on to this fire-brick and then runs in, and is at once on fire. The aperture above the fire-brick, in which the tar runs to the fire, needs to be large enough so that a sufficient quantity of air may enter there to burn the tar. The coke fire below should be left to make a sort of mat, so that there will not be much draught of air through it. Till this body of coke and ashes, or mat, gets to be thick enough, some coke has to be put on the fire in the ordinary way, but not stirred up. The right size of the stream of tar to be burned is indicated by the smoke from the top of the chimney, which should be light and thin in quantity. This shows that the tar is all, or nearly all consumed. If the smoke is much more than above indicated, check the size of the stream of tar flowing at the brass appliance, or increase the size of the aperture so as to let in more air. Burn tar enough to keep up the heat under the retorts, and let in air enough to burn it. The tar required, is very nearly the smallest quantity which will run in the form of a *stream.* And now, as to a more particular description of this brass fixture: It is made with a piston running into its centre; on this piston is an oval head about half an inch in diameter; this oval head is made to grind against a corresponding surface—the tar comes in between these two surfaces and is ground so to speak. This grinding of the tar makes it *flow evenly* and *witho it stoppage*, and in that is the success of the whole operation. There is a set screw which regulates the nearness of these grinding surfaces to each other; and this also regulates the quantity of tar passing through. This screw is easily set, as the occasion requires, by the thumb and finger.

As to the motion of the piston so rs to get the grinding of the tar—there is an arm about three inches long attached to the piston, which is directly under its outside end, and extending down at right angles to the piston. The power required to lift a one-half pound weight is more than sufficient, when applied to this arm, to give the piston all the motion required. When I commenced to burn tar I had no engine, so I obtained the power and motion in the following manner: I had a tank of water in the retort house, from which the water was conveyed to my scrubber by a half-inch pipe, making a fall of six or seven feet in passing; I had an ordinary tinsmith make me an overshot tin water-wheel with four inch length of buckets, 14 or 16 inches diameter. This wheel was set to run in a tin basin or trough. We then cut the pipe leading from the tank to the scrubber, and set the wheel so that the water, in passing, should fall on and turn it—the tin trough catches the water as the wheel turns, and a pipe from its bottom takes the water to the scrubber—it has simply turned this wheel while on its way. The shaft of this wheel is made of ⅜ inch iron wire, and has a crank on one end of 1½ inch bend, from the center. To this crank I attach a small cord, and the other end of the cord is attached to the lower end of the arm, under the piston. As the wheel revolves, the crank draws the cord to the extent of the bend of the crank, and that pulls the arm just the same distance, and then, as the crank comes over on the turn of the wheel, the arm falls back to its upright position by its own weight, or a little weight attached, to be again drawn the same distance by the next turn of the wheel. The arm moving back and forth gives a revolving motion to the piston and effects the grinding of the tar as desired. To fit up for the purpose of burning tar, I went to a pump-maker of this city, and selected a pump of suitable size of bore, and had it specially fitted up with metal valves, so as to be able to pump the tar from the well into the vessel on the top of the bench. This pump cost about $20; the fixture which grinds the tar I had made for me by Mr. Patrick Clark, of Rahway, N. J., who is entitled to the credit of the idea of grinding the tar in this manner, and of the general make of the little composition fixture, though I changed it some from the way he made it, which very materially improved its working; for this I paid him $10—the tar vessel on the bench cost $3. The tin wheel and trough cost $6 or $7. This was all the money paid out, except for a single stop-cock. The men at the gas works did the work of connecting the pipes, etc. This is the whole story. With the hope that this information may be of benefit to the gas fraternity, generally, I remain,

Respectfully yours,

Charles Nettleton,
117 Broadway, N. Y. City

### Crude Petroleum Gas.

Brooklyn, N. Y., December 12, 1873.

Mr. Editor: I thank you for your kind invitation, "To the Gas Fraternity," in your issue of November 3rd, and will take advantage of it to give my views on the subject of crude petroleum gas, which may perhaps rather conflict with yours, as given in your article of the same issue. I claim that crude petroleum can be, and is made into gas at less cost, and more light at a given quantity than from any other material, with greater benefit both to the producer and consumer. The statement of eighteen hundred years ago is just as good to-day—that "you cannot put new wine into old bottles,"—would it not be as well to make the bottles in a measure to fit the wine. Gas is supplied to consumers for the purpose of light, I take it, and not for supplying a quantity of gas, for hydrogen alone or air would be of no use either to consumer or producer, though it would readily measure by the thousand feet. What the consumer wants is a better light and more of it—not more gas.

I claim also that gas can be made by my process cheaper, with more light, from crude petroleum, than from any other material. My last patented process will give from 40 to 50 per cent. better results than the one mentioned by Mr. Waterhouse. 1st. Seven gallons and a half of petroleum, 5¼ cents per gallon, will make 4000 feet of 80 candle gas. 2nd. The works to make the same amount of light, as given by coal, will cost not more than 20 per cent. of coal works. 3rd. The petroleum gas will lose nothing by condensation, either in holder or mains, consequently the only loss

is by leakage, 4th. The gas made by my works is lighter than the atmosphere, and it is not necessary to have the holder weighted quite as heavy as for coal, so that your statement, Mr. Editor, "that a gas of that power must necessarily be heavier than air," is not borne out by the facts.*

Now, the above statements being admitted—and I am ready to prove them; and the further fact admitted, which is patent to all, that the consumer demands a better light, let us examine reasons why petroleum gas should be supplied pure. Seven and a half gallons of petroleum at six cents per gallon cost forty-five and a half cents; labor and fuel, say fifty cents more (labor will not be as much on a large scale). Total cost, ninety-five and a half cents per thousand. Now, that gas supplied to the consumer at *ten dollars* per thousand, will give the consumer a sixteen candle light *for one cent per hour*. Does the consumer get that now, or near it? The most sensitive nerve a man has is his pocket. Consumers are not all fools, and if you save their pockets, the price of gas per thousand, or the quantity, is not taken into account. But what they do take into account is the light they get for the money they pay. Can a producer make more profit by supplying a poor quality than the above? Again, by supplying a pure gas the holder is made of five or six times the capacity, and the mains also.

It won't do to say the above cannot be done, because it is done at Ashtabula, Ohio, and the people are satisfied, as they ought to be, for they are getting their light cheaper than coal gas at $2 per thousand. Coal gas of 11 candles can be made 17, with one part petroleum gas to five parts coal gas, with the above prices that is cheaper than from anything else. Mr. Allen, in an article on the Gwynne-Harris process (issue of December 2), quotes you saying, "So far as our present lights go, it seems as if we would have to settle down for a cheap and effective dilution of our petroleum gas, upon that much scorned and maligned product 'water gas.'" In light of the above why a diluent, when the gentleman confesses further on that he wants *oil* for an illuminator—shows also in the *Scientific American* of November 15th, the so-called Gwynne-Harris process with a separate process for an illuminator, which is not comprised in either one of the Gwynne or Harris patents, but is a clean appropriation of one of my patents.

Yours respectfully,

WILLIAM C. WREN.

[* Our "statement" Mr. Wren will find, if he *reads* it, related to gas of 100 candle power. Mr. W. must *prove* that 80 candle gas is lighter than air before gas men will believe it. Many other of his "statements" callf or stronger support than bald assertion. In saying this, we are not to be understood us denying them at all, but mean simply that that the "statements" of the balance, the photometer, and the chronometer, are what we must have before attention will be given. All else is mere surmise. Mr. Wren says he is "ready to prove" his statement. We shall therefore possess our souls in patience and hold our peace till he has so done.—ED.]

**A Coal Seam Burnt Out.**—The so-called "burning mountain" at Dudweiler, in the district of Saarbruck, which has been an object of interest to tourists and men of science for more than a century, is now shorn of its attractions; to the former it presents the spectacle of what is, at best, but a smoking mountain; to the latter it is a mere imposter, since, instead of being, as was supposed by earlier scientific observers, a display of volcanic action, or a proof of central fires it is now clearly established as the result of the spontaneous combustion of a stratum of coal. These smoldering fires, produced by some change which takes place in the constituents of the coal may indeed, burn with more or less intensity for centuries. The thought of such waste is peculiarly distressing at the present time, and the burning mountain of Dudweiler shows only common good feeling by mitigating its destructive proceedihgs at this crisis.—*Coal Trade Circular.*

[From the American Chemist.]

## On Antimony Perchloride as a Reagent for Oils.

[BY ISIDOR WALZ, PH.D.

All chemists who have occasion to occupy themselves with the analysis and testing of oils must admit the unsatisfactory condition of our science as regards these substances, and the desirableness of finding a larger number of characteristic reagents for the same. With this object in view I first took up anhydrous stannic chloride, but abandoned it after trying it with several oils, because the abundant fumes which it gives off render it a very disagreeable reagent to work with. In passing I may mention that I found anhydrous stannic chloride completely soluble in benzine;* the oil after a time turns reddish-brown and is partially resinified, while large acicular crystals form throughout the liquid.

Turning next to antimony terchloride, I attempted to use (Merck's) "solution of terchloride of antimony, sp. gr. 1·345," but found that this would not mix sufficiently well with oils to produce satisfactory reactions. Good results were, however, obtained by concentrating this solution on the water-bath to syrupy consistence.

Antimony terchloride, as thus prepared, reacts with all the oils which I have tried, animal, vegetable, essential, and those derived from petroleum. (The experiments were made by putting 2-3 c. c. of the oil into a test-tube, adding a few drops of the reagent, and shaking till a mixture was effected).

In the case of the animal and vegetable oils there ensues generally a rapid darkening, the color turning to a reddish, greenish, or dirty brown, accompanied generally by a perceptible rise in temperature, and increased consistency of the oil, the latter becoming viscid, and in one or two cases solidifying altogether. After the lapse of a little time a stratum of antimony chloride solution separates at the bottom of the test-tube, which has a greenish-yellow color. The oils for which this general description may suffice are rape seed, poppy seed, tallow, neat's foot, and sperm.

Some characteristic reactions were observed with the following:

1. Olive oil (three samples). Forms a whitish emulsion, rapidly passing through light to dark green. No perceptible rise of temperature.

2. Cotton-seed oil (two samples). Turns chocolate brown, with evolution of considerable heat. One of the samples solidified a few minutes after the test applied, so that the tube could be inverted, while still warm, without the oil flowing out.

3. Neat's foot oil. Turns pink; subsequently darker and thicker. The temperature rises.

4. Rosin oil, Turns purple. Though the color becomes gradually darker, the peculiar purple tint can be recognized even after a long time.

Of the petroleum oils I tried gasolene, benzine, and kerosene. After shaking, two strata separate in the test-tube. A portion of the oil is resinified, the resin adhering to the sides of the tube as a thin, peculiarly colored, bluish-green-purple coating. The lower stratum is of a bright red color. Antimony terchloride is, therefore, a very good reagent for the petroleum oils.

With oil of turpentine I obtained a very violent reaction, attended by the evolution of great heat and the deposition of a yellowish resinous mass.

LABORATORY, No. 18 EXCHANGE PLACE, N. Y.

**Preventing Fires on Board Ship.**—Dr. M. Schuppert, of New Orleans, proposes to have, in the holds of vessels whose cargoes are liable to spontaneous combustion, boxes filled with marble dust, into which pipes are to be led to convey dilute sulphuric acid. The carbonic acid gas disengaged by the contact of the sulphuric acid will extinguish the fire; and Dr. Schuppert points out that the gas, being heavier than atmospheric air, can easily be confined to the hold of the vessel.

* In this we tpink Dr. Walz has Probably been anticipated by Prof. C. A. Seely, who exhibited to the present writer this curious case of solubility at least two years ago.—ED.

## British Gas Stoves.

[To that wonderful *Thesaurus* of technical news—*Iron*, we are indebted for the following, on a subject now of immense and growing interest.—ED.]

In the construction of the gas-cooking apparatus of Messrs. Leoni & Co., of London, great scientific skill is shown. Durability in the burners is secured by making them of an artificial silicious composition—absolutely incorrodible—called "adamas." As no file will touch "adamas" burners constructed of this material, may be assumed to be as indestructible as they are incorrodible. Thus a ring of gas jets on this principle leaves little to be desired as a heat-generator.

Another important element in the make of Leoni's cooking apparatus is the adoption of a species of fire-clay as the material of the inner jacket. This heat-reflecting lining is about an inch thick, and between it and the outer case is the vacant space previously referred to as a precaution against external radiation. Great use is made of this "Patent Heat Reflector Composition" in all Mr. Leoni's work, and the profuse application of this material forms an important distinction between his inventions and those of other constructors. Mr. Leoni's stoves are of all sorts and sizes, from the huge machines suited to the requirements of a club, a workhouse, or an hospital, to the small and more compact contrivances fitted for the necessities of small families and bachelors.

Very economical are the gas cooking stoves of Messrs. Rillings, who, to avoid the communication of any unpleasant smell to the meat, place their gas-jets above the meat to be roasted, and reflect the heat downwards, while, as in small stovess the hot plate being above the gas, one series of jets is made to perform two operations. Larger stoves on this principle are constructed with two additional stories. The joint is placed at the bottom with the burner over it; over this is fitted a radiating metal plate to reflect the heat, Above this are two ovens and a hot-plate. The distribution of heat is secured by a double jacket—not in this case of fire-clay and iron, but of iron alone.

John Wright & Co., of Birmingham, also depend upon the principle of reflection, but for this purpose rely upon white tiles, which have the advantage of giving their work a neat and clean appearance. Their ovens have stood the test of some experience in the Crystal Palace and elsewhere. Messrs. Wright, however, do not depend entirely upon their tile reflectors, but call in the aid of certain earthen heat-distributors.

## Petroleum as Fuel.

F. G. Woodward, Esq., of Worcester, Mass., writes as follows to the *Scientific American*:

"A series of trials have been made here recently, on a small scale, to determine what may be done with petroleum as a fuel under steam boilers. The boiler used was an ordinary eight horse upright one, about three feet diameter and six feet high, with the usual number of one and a half or two inch vertical flues, the lower flue sheet being about fourteen inches from the grate. The device for burning the petroleum was placed upon the grate, and a stream of oil, scarcely larger than a No. 16 wire or the rapid dropping of the oil (about six quarts an hour), mingled with a certain quantity of air under pressure, was sufficient to raise steam to thirty pounds to the inch in 35 minutes. Considering that during this time the furnace-door was kept wide open for the purpose of observation, and that the boiler was in a cold room and entirely unprotected by jacket, I think this may be regarded as a good result.

"It seems to be requisite that the air should have considerable tension, and mingle with the burning oil in jets, and in quantity proportionate to the quantity of oil, in order to ensure perfect combustion; for it was noticed that, while the apparatus was being adjusted, considerable smoke occasionally arose; but as soon as proper adjustment was reached, and the boiler ond apparatus had warmed up, the consumption was quite free from smoke and gas.

"Although these tests (some half a dozen in number) have been upon a small scale, consuming only about one barrel of oil, all told, they certainly indicate that petroleum has the qualities of a stroug and economical fuel."

**Brooklyn Gasefaction.**—At a meeting of the Brooklyn Board of Aldermen on the 8th December, a special committee reported, which was appointed some months ago to consider the feasibility of the city making its own gas. They took a large amount of testimony on the subject, and showed that the local gas companies were making enormous profits. They also went to Philadelphia and examined the system there, but strange to say they now report against the feasibility of the city going into the gas business. This was the substance of the report of the special committee to the Common Council.

### PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

DECEMBER 16, 1873.

DELIVERED IN NEW YORK.

| | | | |
|---|---|---|---|
| **English Cannel.** | | | |
| Ince Hall | $17 00 | @ | 18 00 |
| Kirkless Hall | 16 50 | @ | 17 00 |
| **English Caking Coals.** | | | |
| Newcastle Gas | $12 00 | @ | 00 00 |
| Liverpool caking | 11 50 | @ | 12 00 |
| **British Province Coals.** | | | |
| International—At Sydney, $2 50 in gold | | | — — |
| Block House—At Mines, $2 50, Gold | | | 0 00 |
| Little Glace Bay—At Mines, 2 50 Gold | | | — — |
| **Pennsylvania Coals.** | | | |
| Penn Gas Coal—At Amooy | $8 50 | @ | 0 00 |
| Westmoreland—At Amboy | 8 50 | @ | 0 00 |
| (In New York both the above coals $9 10) | | | |
| Shafton | 9 10 | @ | 0 00 |
| Youghiogheny—At Baltimore | 7 50 | @ | 0 00 |
| **West Virginia Coals.** | | | |
| MurphyRun | $7 50 | @ | 8 75 |
| Cannelton Cannel | | | 16 50 |
| Despard—At Baltimore | 6 30 | @ | 0 00 |
| West Fairmont | 8 60 | @ | 0 00 |
| American Gas Coal | 8 50 | @ | 0 00 |
| Fairmont | 8 50 | @ | 0 00 |
| Newburgh Orrel | 8 50 | @ | 0 00 |
| Pinnickinick | 8 50 | @ | 8 75 |
| Cloverhill of Virginia | 6 75 | @ | 7 00 |
| McKenzie Compound Mixture | | | — — |
| **American Cannel Coals.** | | | |
| Peytona of West Virginia | $15 50 | @ | 00 00 |
| Darlington of Pennsylvania | | | — — |
| American Cannel | $14 00 | @ | 00 00 |
| **Asphalts.** | | | |
| Albertite of New Brunswick | $— 00 | @ | — 00 |
| Ritchie Mineral of West Virginia | 20 00 | at | Balt'e. |
| Trinidad Bitumen | — — | @ | 14 50 |


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Seventy X Pipes, 5 inches diameter.
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This work comprises the essence of the *London Journal of Gas-Lighting*, from February 10th, 1849, to December 31st, 1868, with the monographs read before the British and North British Associations of Gas Managers, between the latter date and November 1st, 1873. There are also added essays written expressly for the "Synopsis," upon DISTRIBUTION, by two distinguished engineers; and a Zincograph of the latest form of that valuable contribution to the Art, **the Sabbaton Multitubular Condenser.**

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TUESDAY, DECEMBER 16, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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## WATER-GAS.

In the *Scientific American* of November 15, there was an editorial comment upon an illustrated account contained in the same issue of that Journal, of the method of making gas by the interaction, in a clay retort, of anthracite coal and steam, both at incandescence, according to the plan known as the "Gwynne-Harris." The illustrations were taken from apparatus now in use in the works os the Citizens Gas-Light company of Brooklyn.* This account of the Citizens Works we shall pass by, until we have an opportunity to visit these works and see the operation for ourselves, which we trust may be soon; but in the editorial remarks referred to, the name of the present writer was employed in a way which calls for some important disclaimers on his own part. It is stated that "The system in general" (meaning that of making water-gas from carbon and steam, simultaneously with coal-gas) "has found many opponents, notably, among others, the late Dr. Torrey; while Professor Wurtz, in published reports on the subject, has pointed out that it is impossible to convert the steam entirely into hydrogen and carbonic oxide. Some of the steam, he considers, is not decomposed, and, passing into the coal retorts, operates injuriously, probably by oxidizing the olefiant gas. In conclusion, the same author remarks that the greatest of practical objections is 'the uncertainty of the quality of the product.'"

The "published report" referred to is doubtless one which was compiled in the Spring of 1864, now nearly ten years—since which made no pretence to be anything but a historical review of the subject up to that date. A complete account was given, so far as could be brought within the compass, of the devices for making water-gas, and the investigations thereof by chemists and gas-experts, that had been published up to that time; and the conclusions drawn were that "in practice, little or no satisfactory result *has* ever followed," and that "it *has been* found impossible to convert the steam entirely into hydrogen and carbonic oxide," and that "a portion of carbonic acid gas is always found with the carbonic oxide, which is very difficult and expensive to remove" and other conclusions of a similar sort, relating to what *had been* accomplished, or failed in, up to that time—without any attempt, so far as the writer can see, to convey or to imply any prediction or prognosis, as to what the *future* fruit of human labor and brains might be in this field. It is true that this historical report of the writer was appended—in its published form—to another report by two distinguished chemists, one of whom is mentioned by name in the *Scientific American*, as above, the lamented Dr. Torrey—the latter report being one strongly adverse to the value of results then recently obtained in experiments with apparatus devised by Mr. W. H. Gwynne, also since deceased.

It will be observed, however, by any reader of the report of the present writer referred to, that it is a wholly distinct document, no reference whatever being made therein to these Gwynne experiments, and, in point of fact, the writer had never at that time seen the Gwynne apparatus, and had no knowledge thereof, or of any experiments made therewithal.

Some five years subsequent to this date (in the winter and spring of 1868-9) the writer made an extensive research, in conjunction with Prof. Silliman, on what is now known as the Gwynne-Harris process; which occupied him exclusively for over 4 months, during which time over 400,000 feet of water-gas was made by this method, photometric and other tests with numerous analyses being conducted throughout this time; and the conclusion arrived at, and reported professionally, was that the practical difficulties encountered by previous experimenters in this field had been overcome by these inventors, and that the economical production of water-gas in *clay retorts*, and its purification, had been virtually accomplished on a manufacturing scale.

Stress is here laid upon the use of clay retorts, as this is a point of great importance in this connection.

Space fails for the full development of this subject at this time; but it will hereafter be pursued further in connection with extracts from the Report of Silliman and Wurtz upon the extensive experiments made in 1868-9, this Report—which is quite voluminous (126 pages of print, with numerous bulky tabulations) having been circulated as yet only as a very small edition, reaching but a fraction even of the gas profession, to which it was more especially addressed.

H. W.

* The same will be found on our first page to-day.

## OUR CONTRIBUTIONS FROM DR. A. A. HAYES.

In our last two issues, it will have been observed that we are now favored with new communications from this eminent and veteran scientist, one of the very few among American chemists of the first rank, by whom coal-gas, gas coal, and gas chemistry generally, have been made special studies.

It appears, indeed, to be a sign of the times just now, in this country—among some scientists at least—that devotion to a specialty, particularly if such specialty has a technical or industrial bearing—is viewed with disfavor by many, and it is fashionable, inside of certain cliques, to clamor against such specialists, as seekers after popular notoriety, as making a trade, or a "milch cow" of Science, and similar clap-trap. It may be relied on that this sort of snobbery will die out—as it already has in most older communities, with the "rings" which have tried to perpetuate it among us, and that the American public will not be hoodwinked, any more than the rest of mankind, into the idea that Science is to pass under the control and into the hands of any exclusive order of priesthood, as in the days of the Chaldees and the Rosicrucians, and that those who study to make it minister to the needs, comforts, and health of men, do not thereby vulgarize science or degrade themselves into intellectual Pariahs.

Having spoken, as we perceive, somewhat emphatically, it is necessary next to add that, in the preceding paragraph there is not the slightest personal allusion to Dr. Hayes, but that we have merely spoken generally, with a view to introduce the remark that among the special baanches of applied chemistry that a scientist may devote himself to, there is none which requires, for its mastery—in such degree as to confer upon the devotee any fulness of knowledge or ripeness of judgment—longer or more industrious application than the Technology of Gas-Manufacture and Gas-Lighting. A little consideration will show that almost every branch of chemistry and physics must be drawn upon, more or less, by such a (so-called) specialist; and in the study of the nature and origin of the raw materials, Geology and Mineralogy must also be dipped into deeply, even more deeply—(when we take into view the grand and expanding, though youthful, science of Chemical Geology,

a young giant scarce yet out of his teens) than by many who deem *themselves* eminent specialists in those branches.

Dr. Hayes's great learning and long experience give to his views and statements great authority and value. One point only we shall at present be able to glance at. The remark that "coals are never bituminous, and true coals are distinguished from other forms of oxidized hydrocarbons by the absence of bitumen":—is very significant, and if we can devise an appropriate definition for the word *bitumen*, must of course be accepted. To us, however, here lies the difficulty. What definition shall we assign to bitumen. while the term bituminous coal is doubtless highly objectionable, there are many other terms applied in common language to carbon minerals which are quite as meaningless and unscientific. Even the term *coal* itself is undefinable. Asphalts, cannels, malthas, petroleums, are other examples of terms which respectively include mineral matters differing widely from each other in chemical composition and properties, and doubtless in modes of formation.

As to bitumen, Dana makes it a synonym of asphaltum, itself applied indiscriminately in the text-books to every solid combustible, which is either easily fusible, easily soluble (in something or other, it matters little what) or which has some kind of an odor. Albertite is insoluble and inodorous. Hence at first it was a "coal." Then it was proved that it was fusible under pressure; hence it wasn't a coal, and must be an asphalt; these two being the only species admitted by the Procrustean theory of the geologists of the era now passing away, a theory to which all the facts must be strained to fit. Grahamite, which is also inodorous, cakes or admits of pasty fusion also, under pressure:—hence it must also be an asphalt, though chiefly composed (80 to 85 per cent.) of the remarkable constituent called by the writer *irisine*, which is infusible at any temperature or pressure, though wholly soluble in many liquids.

Our own preference would be, in the remodelling of the *scientific* nomenclature of carbon minerals—which must of course long precede any reformation in the language of *hoi polloi*—to cast aside pretty much all these prostituted terms, or at least, not let our minds and our thoughts be governed by them; but, through rational chemical investigation, arrive, as soon as we may, at some scientific basis for a *new* classification and nomenclature. Wisdom and learning are two things. Wisdom has learned to unlearn.

## IRON.

We could not refrain—even if we wanted to—from renewed expressions of admiration, amounting to wonder, as well as of gratitude, towards this splendid new Journal; which, it will be recollected, occupies the place of the old *Mechanics Magazine*. We do not hesitate to pronounce it the finest technical journal in existence (at least, to speak within bounds, on this particular planet of ours, or that part of it known to science). We go even further, and assert that no other journal remotely approaches it in completeness and value.

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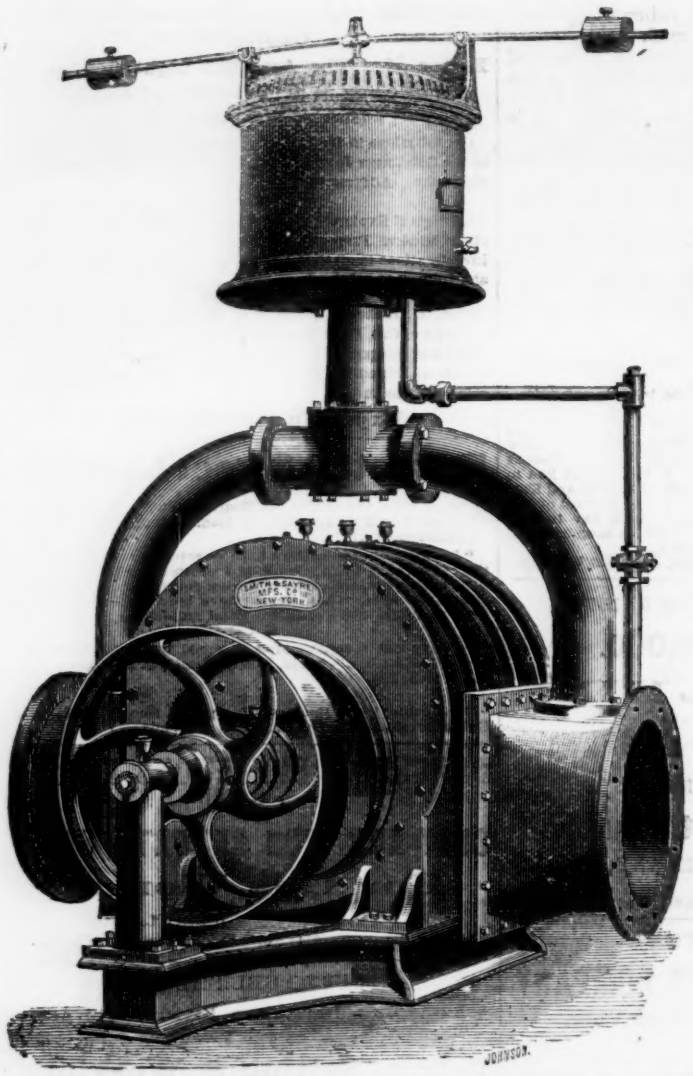


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JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL. Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co., Boston, Mass. Gas-Light Co.: East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas-Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.: Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gas-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light Co., and one hundred others.

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Amer. Gas Screen Man'f'g Co., Haverhill, Mass

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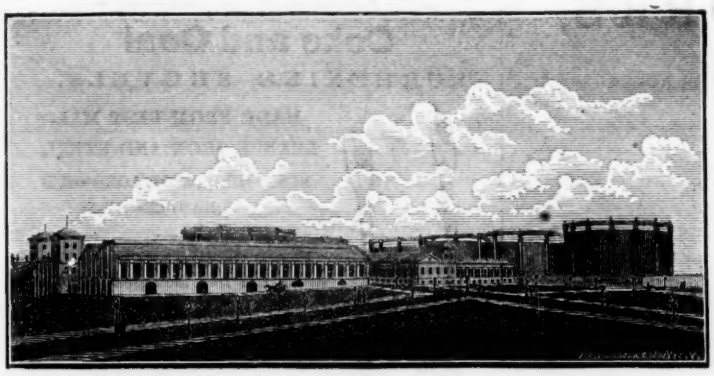
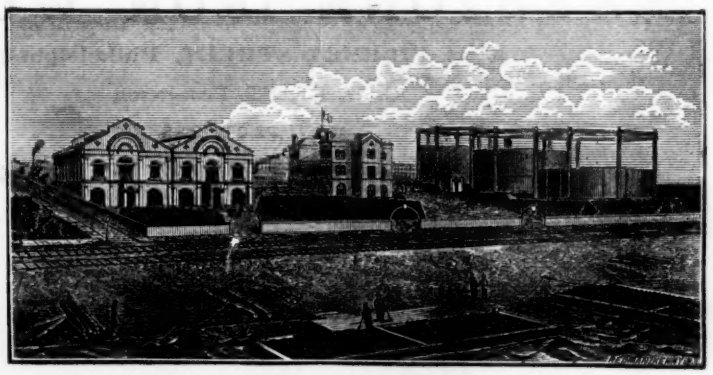
REFERENCE.—RICHARD MERRIFIELD, Esq., late Vice President MANHATTAN GAS-LIGHT COMPANY.



CINCINNATI GAS WORKS. ERECTED 1871-72-73.—WM. FARMER, ENG.



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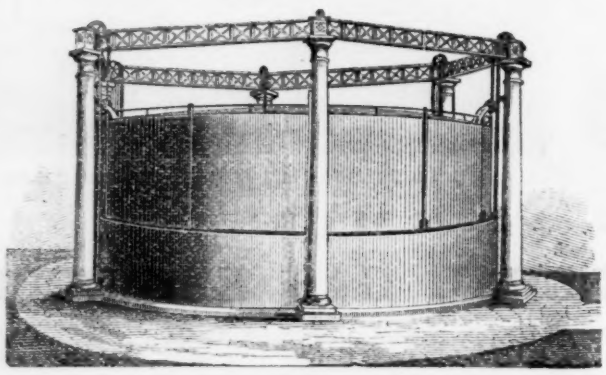

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OFFICE OF

## THE GAS-LIGHT CO. OF AMERICA,

**C. K. GARRISON, President.**
**E. W. McGINNIS, Secretary and Treasurer.**
**JOHN P. KENNEDY, Chief Engineer.**
**LEONARD D. GALE, Consulting Chemist.**

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We are also prepared to contract for putting said process into successful operation in your works, furnishing all the necessary plans, materials, and workmen for that purpose.

We do not deem it necessary to enter upon a detailed description, here, of the processes above referred to, deeming it sufficient to state, to secure your interest and investigation, that they have been in successful operation, for months, in a number of Gas-Light Works in the United States, and are now being introduced in the works of the Mutual Gas-Light Company, of New York City; the Citizens' Gas-Light Company, of Brooklyn; the New Orleans, San Francisco, and very many other Gas-Light Companies throughout the country.

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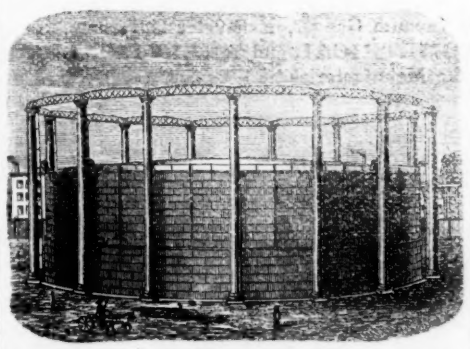

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252-1y

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It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

The best dry coals shipped, and the promptest attention given to orders. 294-1y.

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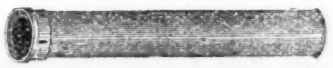

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GAS HEATING AND COOKING APPARATUS,

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## Practical Builders,

**And Contractors for the Erection of Gas Works,**

MANUFACTURERS OF ALL THE LATEST AND MOST IMPROVED APPARATUS AND TOOLS FOR THE MANUFACTURE & DISTRIBUTION OF COAL GAS.

☞ WORKS AT THE RAILWAY DEPOTS,

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We manufacture Bench Castings, Washers, "The Immersed Multitubular," and Atmospheric Condensers, Wet and Dry-Lime Purifiers, Dry Center Seals, Telescopic and Single Gas Holders, Wrought Iron Trussed Roof for Iron or Slate, Wood and Iron Trays for Purifiers, Coke and Coal Carts, Wrought Iron Screening Shovels and Castings, and Wrought Work of every description for Gas-Works.

As Mr. Murray is a Practical Draughtsman, we will furnish plans and specifications to parties or associations, or will wait personally upon parties contemplating the construction of new works, or the alteration or extension of old ones

The most satisfactory references can be given, if required, of the experience and commercial fairness which characterizes our dealings.

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☞ Sole Agents for W. Sugg's **PHOTOMETRICAL** and **ANALYTICAL GAS APPARATUS.**

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*From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.*

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W. W. Goodwin is the author of the History and Principles involved in the use of Lowe's Jet Photometer. Also Patentee and we are the SOLE MANUFACTURERS of the ORIGINAL and ONLY DIAL whereby the CANDLE POWER and PRESSURE can be instantly read, and all others are infringements.

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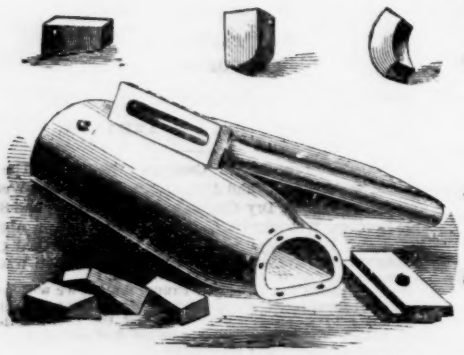

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**The Only XX Fire Brick.**

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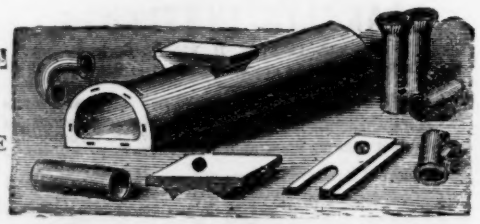

**Vitrified Steam Pressed Drain and Sewer Pipe.**

# 1849. HARRIS, GRIFFIN & CO., 1873.

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Manufacturers of WET AND DRY GAS METERS, STATION METERS, SHOW AND TEST METERS, METER PROVERS, PRESSURE REGISTERS AND INDICATORS, BAR AND JET PHOTOMETERS, WET AND DRY CENTER VALVES, and all Apparatus pertaining to Gas Works in their line.

Patentee and Sole Manufacturer of the ORIGINAL and ONLY CORRECT GAS EXHAUST GOVERNOR.

We hereby caution all parties against making, vending, or using any GAS EXHAUST GOVERNOR that will be an encroachment of our patent.

The support and confidence of Gas Companies, so long enjoyed by us, encourage us to pursue the same undeviating course that has contributed to establish the character of our house, and with our extended experience and increased facilities, develop the latest improvement that Science can apply, in the construction of Gas Meters, etc., and thereby merit a continuance of the favors hitherto so liberally extended to us, always guaranteeing satisfaction.

ANDREW HARRIS. JOHN J. GRIFFIN.

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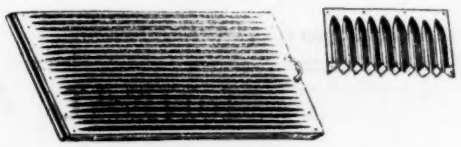
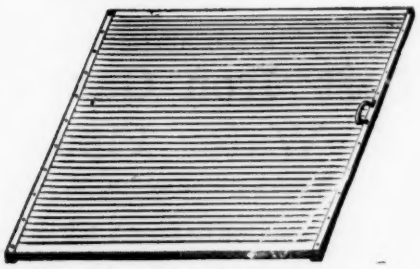
MANUFACTURER OF

**Patent Conically and Diamond Slotted Solid Wood Trays.**





## To Gas Companies.

The above Trays will last longer. and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays. They are now used in over three hundred Gas Companies in he United States, and other places.

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151 and 153 Avenue C, New York.

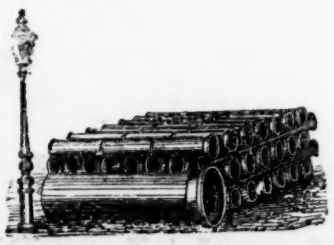
## R. D. WOOD & CO.,

PHILADELPHIA.

MANUFACTURERS OF

## CAST IRON GAS & WATER PIPES,

**Matthews Patent Hydrants, Lamp Posts, Etc.**



For the accommodation of parties who may want small lots Pipe for *immediate* delivery, we have established a yard in New York City.

We have on hand here several thousand feet of small Pipe. from which we can ship orders readily to any part of the country.

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## GAS AND WATER PIPE COMPANY.

**WORKS, AT BAY CITY, MICHIGAN.**

**CHICAGO OFFICE, 646 WABASH AVENUE.**

SECTION OF GAS PIPE

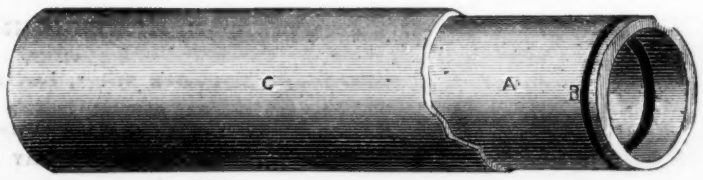

FIG. 2.

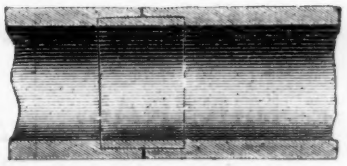

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

Above is a cut of the

## "WYCKOFF PATENT IMPERISHABLE GAS PIPE,"

manufactured by the NORTHWESTERN GAS AND WATER PIPE COMPANY.

This Pipe is made of White Pine, one inch to sixteen inches bore, in sections eight feet long rounded in a lathe, coated inside and out with Asphaltum, connected with a tenon, or socket, and a thimble joint, perfectly air and water tight, being driven together with cement furnished by the Company. When laid its cost is about one half that of Iron Pipe, and is UNQUESTIONABLY the best Gas conducting Main in use.

☞ Send for Descriptive Pamphlet and Price List. 242–1y

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**PLYMOUTH IRON WORKS,**

CONSHOCKEN, PA.,

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Also, Heavy and Light Castings of every description.
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FOR WATER AND GAS,

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**GAS WORKS AND MACHINERY CASTINGS**

OF EVERY DESCRIPTION,

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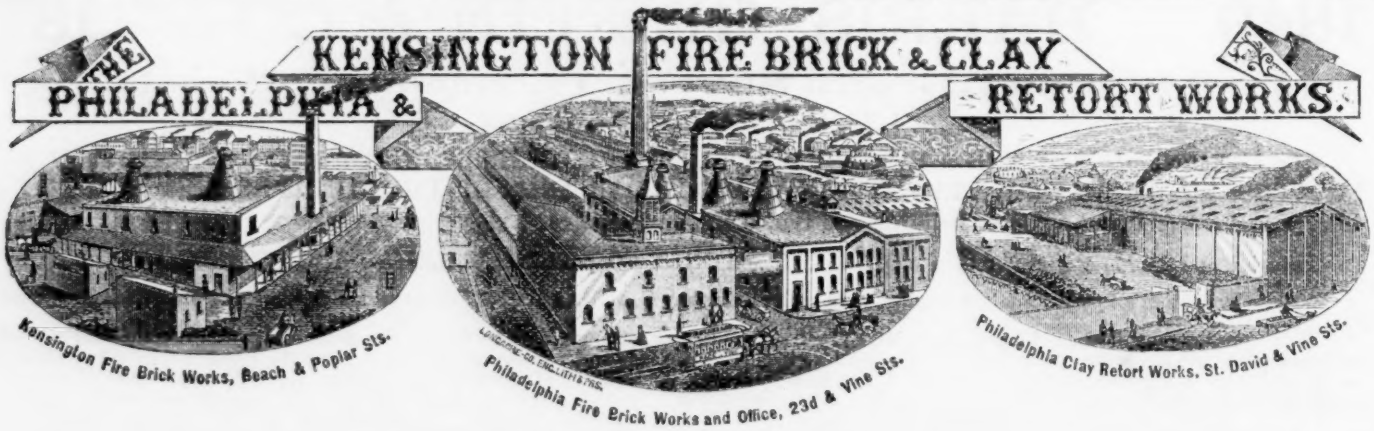
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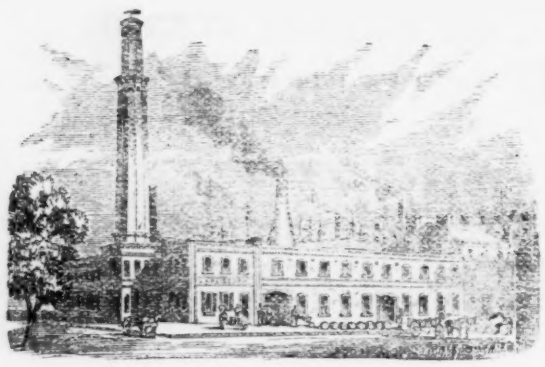
☞ Plans of Settings for Benches of Threes, Fives, and Sixes furnished, free of charge, upon application.



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☞ *Established in* 1845. ☜
(Branch works at Kreischerville, Staten Island.)

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Having withdrawn from the firm of R. D. Wood & Co., the practical management of which we have had since the organization of that firm until June 1871, we have now completed our Works for the manufacture of CAST IRON PIPE and Castings generally.

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The yield of this Asphalt is nearly double, and the Candle Power more than double the product of Gas Coals, and it is extensively used by great and small companies, chiefly as an enricher and stimulant, in the proportion of five per cent. Yield 15,000 to 16,000 feet per gross ton. Illuminating power 20 to 22 candles. One bushel of lime purifies 6000 feet. Coke very strong. It is incapable of spontaneous combustion or caking in the heap, and is used by simple addition to the charge.

We sell at figures which allow a much larger profit to the purchaser, with better light than any standard coal.

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**Several Thousand 3, 4 and 6 inch Cast Iron GAS and WATER PIPES on hand, for immediate delivery.**

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## Established 1836.
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## GAS BURNERS AND STREET LAMPS.
***Cocks of every description.***
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**Station Meters, Center Seals, Governors, Pressure Registers,**

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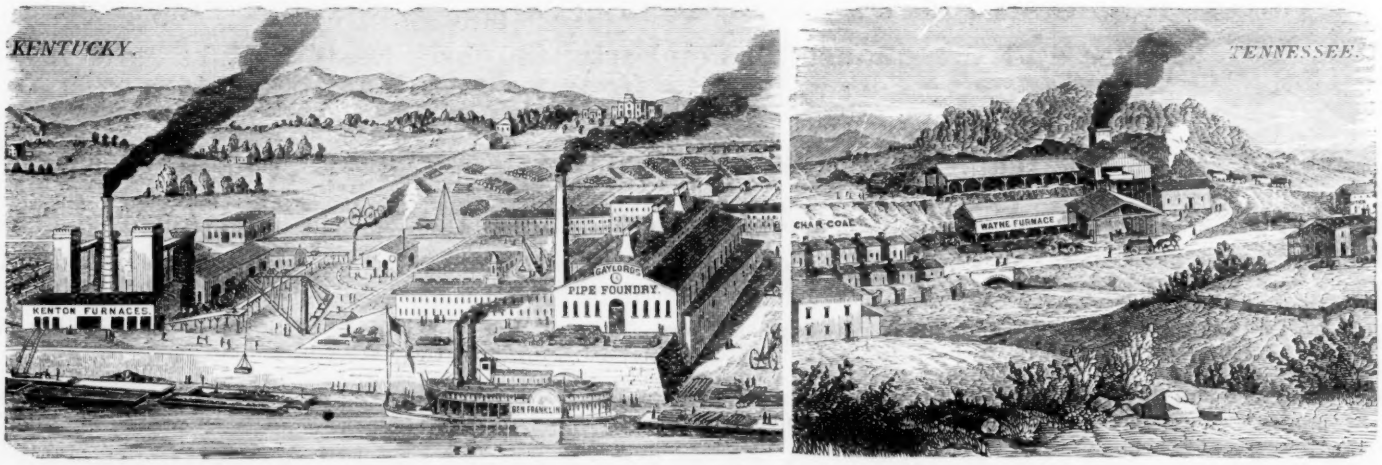


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## FLANGE, STEAM and HEATING PIPE.

Our KENTON FURNACE gives us a fine quality of Stone Coal Iron; this with our Tennessee Charcoal Iron, which we retain for our Foundry use, enables us, by controlling our Iron, to turn out Castings of a uniform and superior quality, and at a cost advantageous to our Customers.

Exclusive Manufacturers of the **ROBBINS JOINT** for Street Mains. The Superintendent of the Indianapolis Gas Company (and many others) say of this Joint: "Its superiority consists of facility in laying, economy in time and lead, and above all, its perfection as a joint.

Estimates given for Furnishing and Laying Street Mains with either common or Robbins Joint.



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## GEO. A. McILHENNY'S

PATENT

## VACUUM PROCESS,

**FOR RELIEVING GAS RETORTS FROM PRESSURE.**

Patented in the United States and Great Britain, June 1867 first patent for this purpose in the United States (but not presented to the public until fully tested). Now in successfu operation for six years, with most satisfactory results.

The many devices lately brought to the notice of the American public, to accomplish the same results are mostly old English contrivances tried and abandoned years ago, on account of the machinery, stuffing boxes, valves, levers, etc., necessary

But the extraordinary results obtained by the McIlhenny process, have induced some unprincipled persons to bring to the notice of the public, as *recent inventions of their own*, some of these old devices; their purpose seems to be simply to evade the patent.

This process is not only safe, simple and effective, but costs little to apply. The only machinery necessary is a one and a half inch stop cock, and a half inch stop cock to each bench No alteration in the old system is required. In fact, a Works operated with this process, can at any time be operated on the old pressure system, simply by closing the two stop cocks above mentioned. There is nothing to get out of order, nothing that requires special attention; no stuffing-boxes to pack and keep tight, no valves to keep clear of tar and pitch, no levers to lubricate, and no expense for a great amount of machinery.

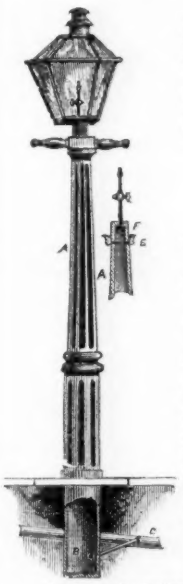
The McIlhenny process challenges the world as regards yield and quality of gas.

For particulars apply to GEO. A. McILHENNY, Engineer of the Washington, Gas-Light Co., Washington, D. C., or to WILLIAM YORKE, Engineer of the Portland Gas-Light Co., Portland, Me., who will take pleasure in corresponding with any one interested. 367-1y



GRAHAM'S

## Patent Anti-Freezing LAMP POST.



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WOOSTER, OHIO
Jan. 24, 1871.

J. W. GRAHAM,

Dear Sir: Yours of the 14th inst at hand. In reply I would say that we have tested the six anti-freezing Lamp Posts purchased from you, and find them to be all as you represented. Whilst nearly a dozen of our sixty-five Posts were frozen down last month and first of this not one of yours was affected by the heavy frost. What can you sell them at?

Yours truly,
LUCAS FLATTERY
Sec'y Wooster Gas-Light Co.

Address the Patentee,

**J. W. GRAHAM,**
Chillicothe, Ohio.

250-9t

THOMAS T. TASKER JR. STEPHEN P. M. TASKER.

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TASKER IRON WORKS, NEWCASTLE, DEL.

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**Office and Warehouse, 15 Gold Street, New York.**

**Office and Warehouse 29 Pemberton Square, Boston, Mass.**

**Established 1821.**

FOR GAS WORKS MACHINERY, ADDRESS OFFICE, FIFTH AND TASKER STREETS, PHILADELPHIA.

Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

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**SCRUBBERS.**—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

**WASHERS.**—Cataract and Single and Multitubular Spray Washers.

**CONDENSERS.**—Single and Multitubular Air and Water Condensers.

**PURIFIERS.**—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Ash Rivetted or Wrought or Cast Iron Lime Sieves.

**CARRIAGES.**—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

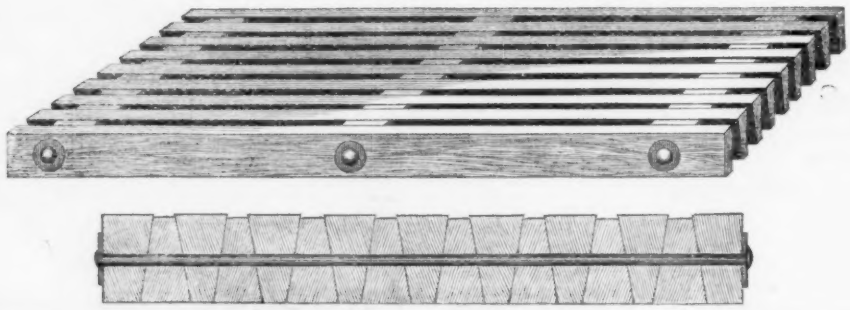
**METERS.**—Square and Round Meters of any capacity.

**GAS HOLDERS.**—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

**GAS GOVERNORS.**—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

**STOP VALVES.**—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

## *P. Munzinger's Patent Ash Lime Trays.*



***In use at the following Gas-Light Companies:***

Pittsburg Gas Company, Pa.
Peoples Gas Company, Baltimore.
Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
Albany Gas-Light Company, N. Y.
Schenectady Gas-Light Company, N. Y.
Utica Gas-Light Comwany, N. Y.
Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.

New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas-Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio,
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas-Light Company, Ohio.

Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Houston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
Middletown Gas Company, New York.
Washington Gas-Light Company, Pa.
Princeton Gas-Light Company, N. J.
Newark Gas Company, Ohio.
Pontiac Gas-Light Company, Mich.
And numerous other Companies.